

DESCRIPTION

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DATA ITEM LIST DISPLAY APPARATUS, DATA  
ITEM LIST DISPLAY METHOD, AND COMPUTER-READABLE  
5 RECORDING MEDIUM RECORDED WITH DATA ITEM LIST  
DISPLAY PROGRAM

TECHNICAL FIELD

The present invention relates to data item  
10 list display apparatuses, data item list display  
methods, and computer-readable recording media  
recorded with data item list display programs, and  
more particularly to a data item display apparatus,  
a data item list display method, and a computer-  
15 readable recording medium recorded with a data item  
list display program for displaying data items of  
different attributes.

BACKGROUND ART

20 Groupware utilizing recent LAN or intranet  
technologies has been widely used so that more and  
more users share communication or information. The  
groupware has been required to have a variety of  
functions and to be easy to use. Therefore, it is  
25 necessary to display a variety of data items in a  
groupware server in a list so that the data items  
are easy to recognize visually and to use.

In the groupware, information of data  
items of a variety of attributes such as MAIL,  
30 SCHEDULE, MEMO, FORUM, LIBRARY, and DOCUMENT  
simultaneously exists. A user may select necessary  
information therefrom and store the selected  
information in a folder used exclusively for the  
selected information. Then, the user may reuse the  
35 selected information. In such a folder, a large  
number of data items of different attributes are  
stored.

A conventional display apparatus, when displaying a large number of data items of different attributes in a list, displays the data items uniformly in a list format.

5           FIG. 1 is a diagram showing a conventional list using large icons. In this list, data items are displayed in large icons that are arranged successively from top to bottom in rows. Each of data item attributes is represented by a  
10 corresponding large icon type. FIG. 2 is a diagram showing a conventional list using small icons. In this list, data items are displayed in small icons that are arranged successively from top to bottom in rows. Each of data item attributes is represented  
15 by a corresponding small icon type.

FIG. 3 is a diagram showing a conventional list in a list format. In this list, each data item is displayed by a set of a small icon and its name arranged in a row. The rows of the sets are  
20 arranged from top to bottom. Each of data item attributes is represented by a corresponding small icon type. FIG. 4 is a diagram showing a conventional list in a detailed format. In this list, each data item is displayed by a set of a  
25 small icon, its name, size, and modified date arranged in a row. The rows of the sets are arranged from top to bottom. Each of data item attributes is represented by a corresponding small icon type.

30           In a conventional display apparatus, a data item list is displayed all by using only large icons or all by using only small icons, and data item attributes are only distinguished by icon types. However, data items of a single attribute are  
35 displayed all in the same icon size that is predetermined to be large or small. For instance, in a list of data items of a folder storing only

mail data, the data item of each mail data is displayed in a large icon, and in a list of data items of a folder storing only memo data, the data item of each memo data is displayed in a small icon.

5 Therefore, a list of data items of different attributes and a list of data items of a single attribute are displayed in different display formats, thus making it difficult for users to understand those lists.

10 Further, in the list in the display format shown in FIG. 4, the contents displayed in each column are fixedly determined. Therefore, in displaying data items of different attributes, only somewhat common items such as name, size, type, and  
15 modified data can be displayed, thus causing a problem that all the desired information to be displayed of each data item cannot be displayed simultaneously in the list.

## 20 DISCLOSURE OF THE INVENTION

It is a general object of the present invention to provide a data item list display apparatus, a data item list display method, and a computer-readable recording medium recorded with a  
25 data item list display program by which a data item can be displayed in the same display format in a list of data items of different attributes and in a list of data items of a single attribute so that users can easily understand the lists without  
30 confusion.

The above object of the present invention is achieved by a computer-readable recording medium recorded with a data item list display program for causing a computer to function as list display means  
35 for displaying a plurality of data items in different display forms in a list, the display forms corresponding to respective attributes of the data

items.

According to this recording medium, a plurality of data items are displayed in a list in different display forms corresponding to respective attributes of the data items. Therefore, a data item can be displayed in the same display format in a list of data items of different attributes and in a list of data items of a single attribute. Hence, users can easily understand the lists without confusion. Further, all the desired information of each data item can be displayed, thus making it easy to find objective data from a list.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings, in which:

FIG. 1 is a diagram showing a conventional list using large icons;

FIG. 2 is a diagram showing a conventional list using small icons;

FIG. 3 is a diagram showing a conventional list in a list format;

FIG. 4 is a diagram showing a conventional list in a detailed format;

FIG. 5 is a block diagram of a data item list display apparatus according to an embodiment of the present invention;

FIG. 6 is a flowchart of an example of a drawing operation performed by the data item list display apparatus of the present invention;

FIG. 7 is a flowchart of an example of a drawing operation performed by the data item list display apparatus of the present invention;

FIG. 8 is a diagram showing a first

example of list display items;

FIG. 9 is a diagram showing a structure of a first example of a display format master 62;

FIG. 10 is a diagram showing a structure  
5 of a first example of a column master 64;

FIG. 11 is a diagram showing a structure of a first example of an icon master 66;

FIG. 12 is a diagram showing a structure of a first example of a table 68 of correspondence  
10 between the list display items and display formats;

FIG. 13 is a diagram showing a first example of the drawn table 68 of correspondence between the list display items and the display formats of FIG. 12;

FIG. 14 is a flowchart of a column header switching operation performed by the data item list display apparatus of the present invention;

FIG. 15 is a diagram showing a displayed column header drawing area 70 in a case where a data  
20 item of a MAIL attribute is selected;

FIG. 16 is a diagram showing the displayed column header drawing area 70 in a case where a data item of a TO DO (SCHEDULE) attribute is selected;

FIG. 17 is a diagram showing the displayed  
25 column header drawing area 70 in a case where a data item of a CALENDAR attribute is selected;

FIG. 18 is a diagram showing the displayed column header drawing area 70 in a case where a data item of a FORUM attribute is selected;

FIG. 19 is a diagram showing the displayed  
30 column header drawing area 70 in a case where a data item of a MEMO attribute is selected;

FIG. 20 is a diagram showing the displayed column header drawing area 70 in a case where a data  
35 item of an ADDRESS attribute is selected;

FIG. 21 is a flowchart of a sorting operation performed by the data item list display

apparatus of the present invention;

FIG. 22 is a flowchart of a sorting operation performed by the data item list display apparatus of the present invention;

5 FIG. 23 is a flowchart of an example of a slide operation;

FIG. 24 is a flowchart of an example of a replacement and slide operation;

10 FIG. 25 is a diagram for illustrating sorting;

FIG. 26 is a diagram showing a display state before sorting;

FIG. 27 is a diagram showing a display state after sorting;

15 FIG. 28 is a flowchart of a column display width change operation performed by the data item list display apparatus of the present invention;

FIG. 29 is a diagram showing a second example of the list display items;

20 FIG. 30 is a diagram showing a structure of a second example of the display format master 62;

FIG. 31 is a diagram showing a structure of a second example of the column master 64;

25 FIG. 32 is a diagram showing a structure of a second example of the icon master 66;

FIG. 33 is a diagram showing a structure of a second example of the table 68 of the correspondence between the list display items and the display formats; and

30 FIG. 34 is a diagram showing a second example of the drawn table 68 of the correspondence between the list display items and the display formats of FIG. 33.

35 BEST MODE FOR CARRYING OUT THE INVENTION

A description will now be given, with reference to the accompanying drawings, of an

embodiment of the present invention.

FIG. 5 is a block diagram of a data item list display apparatus according to the embodiment of the present invention. This data item list display apparatus includes a conventional personal computer and a conventional workstation. In the drawing, an input device 20, a storage device 30, a display unit 40, and a printing device 50 are connected via a bus 15 to a central processing unit 10. The input device 20 includes a keyboard 21, a mouse 22, and a scanner 23. The storage device 30 includes a RAM 31, a ROM 32, a hard disk drive 33, and a flexible disk drive 34. The CPU 10 executes a variety of operation programs stored in the storage device 30 for performing later-described operations, of which the results are stored in the storage device 30, displayed on the display unit 40, and printed out from the printing device 50 by the CPU 10. The storage device 30 stores a variety of libraries in addition to the operation programs.

FIGS. 6 and 7 are flowcharts of an example of a drawing operation performed by the data item list display apparatus of the present invention. This operation is initiated, for instance, by a user selecting a folder storing data items of different attributes.

In step 10 of FIG. 6, all data items included in a specified folder are read out from a data item group 60 stored in the hard disk drive 33, and are stored in a work area of the RAM 31 as list display items. FIGS. 8(A) and 8(B) show a first example of the list display items. For convenience of drawing, FIG. 8 is divided into FIGS. 8(A) and 8(B). With respect to the list display items, the attribute of each list display item is stored first, and thereafter, all or a part of the first through fifth items and content item of each list display

item are stored depending on the attribute. For instance, if the attribute is MAIL, the title, data and time, sender, sender address, state (read or unread), and initial sentences of a mail are stored  
5 in the first through fifth items and content item, respectively. The list display items are arranged in an order entered in the data item group 60, that is, in descending order.

Next, in step S12, the list display items  
10 are checked one by one with a display format master 62 so that a table 68 of correspondence between the list display items and display formats is created. The display format master 62, a column master 64, and an icon master 66 are prestored in the hard disk  
15 drive 33. As shown in FIG. 9, a display method, an icon number, a column name, a font, a font size, a font color, the presence or absence of content display, display conditions, and a display area size of each data item are stored for each display format  
20 name in the display format master 62.

As shown in FIGS. 10(A) and 10(B), an icon number, a heading, and the width of each of first through fifth columns are entered for each column name in the column master 64. FIG. 10 is divided  
25 into FIGS. 10(A) and 10(B) for convenience of drawing. As shown in FIG. 11, icon names each indicating an icon design are entered in correspondence to the respective icon numbers.

In step S12, the display format master 62  
30 is referred to by the attribute of each of the list display items, and thereafter, a display format name whose display conditions correspond to the first through fifth items and content item of each data item is obtained. Then, the obtained display format  
35 name is added to each of the list display items so that the table 68 of the correspondence between the list display items and the display formats shown in



FIGS. 12(A) and 12(B) is created to be stored in the hard disk drive 33.

Next, in step S14, the height and width of a present drawing position are initialized to zero, and a preceding display method, or a method of displaying a preceding data item, and the height and width of a preceding area, or an area for displaying the preceding data item, are initialized to NULL. The height H and width W of the drawing area of a display window are predetermined. Next, in step S16, a data item is read from the table 68 of the correspondence between the list display items and the display formats. Then, in step S18, the method of displaying the data item, or a present display method, is retrieved by referring to the display format master 62 by the display format name of the data item, and it is determined whether the present display method displays data items by using large or small icons, or in details or in a list. If the present display method is determined to display data items in details or in a list, the operation proceeds to step S20, and if the present display method is determined to display data items by using large or small icons, the operation proceeds to step S22.

In step S20 of FIG. 7, the present drawing position is moved onto the next line. Here, the height of the present position is determined by adding the height of the preceding area thereto, and the width of the present drawing position is set to zero. Next, in step S24, the data item read from the correspondence list 68 between the list display items and the display formats is drawn in the present drawing position by the present drawing method by using the column master 64 and the icon master 66.

Next, in step S26, the width of the

present drawing position is determined by adding the width of the preceding area thereto. Further, in step S28, the height of a present area, or the height of the display area size of the data item read from the correspondence list 68 between the list display items and the display formats by referring to the display format master 62 by the display format name of the data item, is set in the height of the preceding area, and in step S30, the present display method is set in the preceding display method. Thereafter, in step S32, it is determined whether all the data items read from the table 68 of the correspondence between the list display items and the display formats have been processed. If all have not been processed, the operation goes to step S16, and if all have been processed, this operation ends.

On the other hand, if it is determined in step S18 that the present display method displays data items by using large or small icons, in step S22 of FIG. 7, it is determined whether the present display method matches the preceding display method. If the present display method does not match the preceding method, the operation proceeds to step S20, and if the present display method matches the preceding display method, the operation proceeds to step S34. In step S34, it is determined whether a value obtained by subtracting the width of the present drawing position from the width W of the drawing area of the display window is greater than the width of the present area, or the width of the display area size of the data item read from the correspondence list 68 between the list display items and the display formats by referring to the display format master 62 by the display format name of the data item. If it is determined in step S34 that the obtained value is not greater than the

width of the present position, the data item is prevented from being drawn in the line, so that the operation proceeds to step S20 for feeding a line. If it is determined in step S34 that the obtained value is greater than the width of the present position, the data item can be drawn in the line, so that the operation proceeds to step S36.

In step S36, the data item read from the correspondence list 68 between the list display items and the display formats is drawn in the present drawing position by the present drawing method by using the column master 64 and the icon master 66. Next, in step S38, the width of the present drawing position is determined by adding the width of the preceding area thereto.

Further, in step S40, it is determined whether the height of the present area is higher than that of the preceding area, and only if the height of the present area is higher than that of the preceding area, in step S42, the height of the present area is set in that of the preceding area. Thereafter, in step S32, it is determined whether all the data items read from the table 68 of the correspondence between the list display items and the display formats have been processed. If all have not been processed, the operation goes to step S16, and if all have been processed, this operation ends.

FIG. 13 is a diagram showing a first example of the drawn table 68 of the correspondence between the list display items and the display formats. Here, the display method, or a form of display, uses a detailed format for first through sixth data items, a large icon format for a seventh data item, and a list format for an eighth data item. Further, although the attributes of both first and sixth data items are MAIL, the first data item has

been read while the sixth data item has been unread,  
as shown in FIG. 12. Therefore, based on the  
display format master 62 of FIG. 9, the read first  
data item is displayed in the detailed format in  
5 MAIL FORMAT 1 with content display, and the unread  
sixth data item is displayed in the detailed format  
in MAIL FORMAT 2 with a content display.

Next, a description will be given, with  
reference to FIGS. 29 through 34, of a second  
10 example of the drawing operation. FIGS. 29, 30, and  
33 are divided into FIGS. 29(A) and 29(B), 30(A) and  
30(B), and 33(A) and 33(B), respectively, for  
convenience of drawing. FIGS. 29(A) and 29(B) show  
a second example of the list display items. With  
15 respect to the list display items, the attribute of  
each list display item is stored first, and  
thereafter, all or a part of the first through fifth  
items and content item of each list display item are  
stored depending on the attribute.

20 FIGS. 30(A) and 30(B) show a second  
example of the display format master 62. In the  
display format master 62 of FIG. 9, the same font  
size is provided for the display format names.  
However, in the display format master of FIG. 30,  
25 the font size is set to "11", "16", and "22" with  
respect to the majority of the display format names,  
the display format name "MAIL FORMAT 2", and a  
display format name "FORUM FORMAT 2", respectively,  
and the height and width of "the display area size  
30 of each data item" are determined based on the font  
size. Further, the fonts "Times New Roman" and  
"Courier New" are specified for display format names  
"CALENDAR FORMAT" and "ADDRESS FORMAT", respectively.

In a second example of the column master  
35 64 shown in FIG. 31, an icon number, a heading, and  
the width of each of first through fifth columns are  
entered for each column name. In a second example

of the icon master 66 shown in FIG. 32, icon names each indicating an icon design are entered in correspondence to the icon numbers.

5 The display format master 62 of FIG. 30 is referred to by the attribute of each of the list display items of FIG. 29, and thereafter, a display format name whose display conditions correspond to the first through fifth items and content item of each data item is obtained. Then, the obtained  
10 display format name is added to each of the list display items so that the table 68 of the correspondence between the list display items and the display formats shown in FIGS. 33(A) and 33(B) is created.

15 FIG. 34 is a second example of the drawn table 68 of the correspondence between the list display items of FIG. 33 and the display formats. Here, the display method (display form) uses the detailed format for first through third data items,  
20 the list format for a fourth data item, a small icon format for a fifth data item, the detailed format for a sixth data item, the large icon format for a seventh data item, and the detailed format for an eighth data item.

25 Further, although the attributes of both first and sixth data items are MAIL, the first data item has been read while the sixth data item has been unread, as shown in FIG. 33. Therefore, based on the display format master 62 of FIG. 30, the read  
30 first data item is displayed with the font size of 16 in MAIL FORMAT 1 with no content display, and the unread sixth data item is displayed with the font size of 11 in MAIL FORMAT 2 with content display.

35 Further, since the fourth data item is provided with FORUM FORMAT 1, the fourth data item is displayed with the font size of 22 in Gothic typeface based on the display format master 62 of

FIG. 30, and since the eighth data item is provided with FORUM FORMAT 2, the eighth data item is displayed with the font size of 11 in Gothic typeface based on the display format master 62.

5                   Thus, a plurality of data items are displayed in a list in different display forms based on the respective attributes. Therefore, the same display format can be used to display a data item in a list of data items of different attributes and in  
10 a list of data items of a single attribute. This allows users to understand the lists more easily without confusion. Further, all the desired information to be displayed of each data item can be displayed without fail, thus making it easy to find  
15 objective data from a list.

                  The data item list display apparatus of the present invention includes the display format master 62 as a table of correspondence that has the display forms corresponding to the attributes, the  
20 column master 64, and the icon master 66, and determines the display form of each of data items displayed in a list by referring to the display format master 62, the column master 64, and the icon master 66 by the attribute of each of the data items.  
25 Therefore, a display form for the attribute of each data item can be easily changed by updating the display format master 62, the column master 64, and the icon master 66.

                  The display format master 62, the column  
30 master 64, and the icon master 66 have the display forms corresponding to predetermined conditions so that the display form of each of data items displayed in a list is determined by referring to the display format master 62, the column master 64,  
35 and the icon master 66 by the attribute and contents of each of the data items. Therefore, even if data items are of the same attribute, the data items are

displayed in different display forms depending on whether the data items satisfy predetermined conditions, thus making it easy for the users to understand whether the data items satisfy the

5 predetermined conditions. Further, since data items are displayed by adding thereto icons of different sizes based on their display forms, each of the data items can be displayed with an icon of an appropriate size for its display format. Therefore,

10 a data item can be displayed with the same icon in a list of data items of different attributes and in a list of data items of a single attribute. Furthermore, since data items are displayed in different types of fonts depending on their display

15 forms, each of the data items can be displayed in a suitable type of font for its display format. Therefore, a data item can be displayed in the same font type in a list of data items of different attributes and in a list of data items of a single

20 attribute.

Moreover, since each of data items of different display forms is aligned to be displayed, the icons of the data items can be arranged to be displayed in order. Further, since an area where

25 data items have been displayed and an area required to display data items are managed, the icons of the data items can be arranged to be displayed in order.

FIG. 14 is a flowchart of a column header switching operation performed by the data item list

30 display apparatus of the present invention. This operation is performed following the drawing operation. In the drawing, in step S50, an input is awaited. In step S52, it is determined whether the drawing operation is canceled to terminate. In step

35 S54, it is determined whether any one of data items is selected. The selected data item is displayed by turn over indication. In the example of FIG. 13,

the fourth data item is selected.

After the data item is selected, the operation proceeds to step S56 where the focused-on data item, or the data item displayed by turn over indication, is obtained. Then, in step S58, a display format name corresponding to this data item is obtained by referring to the table 68 of the correspondence between the list display items and the display formats. Next, in step S60, a column name is obtained by referring to the display format master 62 by the obtained display format name, and in step S62, the column format, or the contents of the first through fifth columns, of the obtained column name is obtained by referring to the column master 64 by the obtained column name. Then, in step S64, the column format, or the contents of the first through fifth columns, is drawn in a column header drawing area 70, which is the second line from top in FIG. 13. Thereafter, the operation proceeds to step S50.

Here, FIG. 15 shows the displayed column header drawing area 70 in a case where a data item of the MAIL attribute is selected. FIG. 16 shows the displayed column header drawing area 70 in a case where a data item of the TO DO (SCHEDULE) attribute is selected. FIG. 17 shows the displayed column header drawing area 70 in a case where a data item of the CALENDAR attribute is selected. FIG. 18 shows the displayed column header drawing area 70 in a case where a data item of the FORUM attribute is selected. FIG. 19 shows the displayed column header drawing area 70 in a case where a data item of the MEMO attribute is selected. FIG. 20 shows the displayed column header drawing area 70 in a case where a data item of the ADDRESS attribute is selected.

Thus, a column header corresponding to the



display format of a selected one of data items displayed in a list is displayed, thus allowing the users to easily understand the displayed contents of the selected data item.

5               FIGS. 21 and 22 are flowcharts of a sorting operation performed by the data item list display apparatus of the present invention. This operation is performed following the drawing operation. In step 70 of FIG. 21, an input is  
10               awaited. In step S72, it is determined whether the drawing operation is canceled to terminate. Then, in step S74, it is determined whether sorting is selected by clicking the column header drawing area 70. If sorting is selected, the operation proceeds  
15               to step S76 where a focused-on data item is obtained. If there is no focused-on data item, a top, or first, data item is obtained.

              Then, in step S78, a number indicating the display order of the focused-on data item is  
20               obtained to be stored in a variable P. Next, in step S80, the display order of the focused-on data item is advanced to the top, or the first, and a slide operation is performed to shift the subsequent data items until the number of the variable P.  
25               Further, in step S82, an initialization operation is performed. Here, a present item position s is set to 1, and a present comparison position t is set to 2. Further, the display format of the focused-on data item is set in a display format, or a column, u.

30               Next, in step S84, it is determined whether the display format of a data item indicated by the present comparison position t is equal to the display format (column) u. If the display formats are different, the operation proceeds to step S92 of  
35               FIG. 22, and if the display formats are equal, in step S86, it is determined whether the display format of a data item indicated by the present item

position s is equal to the display format (column) u.  
If the display formats are different, the operation  
proceeds to step S90 of FIG. 22, and if the display  
formats are equal, the operation proceeds to step  
5 S88.

In step S88, it is determined whether the  
value of the data item indicated by the present  
comparison position t is smaller than that of the  
data item indicated by the present item position s.  
10 If the value of the data item indicated by the  
present comparison position t is smaller than that  
of the data item indicated by the present item  
position s, the operation proceeds to step S90 where  
a replacement and slide operation is performed to  
15 replace the data item indicated by the present item  
position s with the data item indicated by the  
present comparison position t and to shift the rest  
of data items backward. Here, the value of a data  
item refers to the value of the character or numeric  
20 character string of the first item of the data item.  
However, the value of a data item is not limited to  
this, but may be the value of the character or  
numeric character string of a specified item of the  
data item.

25 If the value of the data item indicated by  
the present comparison position t is greater than or  
equal to that of the data item indicated by the  
present item position s, the operation proceeds to  
step S92. In step S92, the value of the present  
30 comparison position t is incremented by one, and in  
step S94, it is determined whether the value of the  
present comparison position t is the final one, that  
is, it is determined whether the value of the  
present comparison position t is equal to the number  
35 of the data items in the table 68 of the  
correspondence between the list display items and  
the display formats. If the value of the present

comparison position  $t$  is the final one, in step S96, the present comparison position  $t$  is set to a value obtained by adding two to the present item position  $s$  and the present item position  $s$  is incremented by one. Thereafter, in step S98, it is determined whether the value of the present item position  $s$  is the final one, that is, it is determined whether the value of the present item position  $s$  is equal to the number of the data items in the table 68 of the correspondence between the list display items and the display formats. If the value of the present item position  $s$  is the final one, in step S100, the drawing operation of FIGS. 6 and 7 are performed to perform redrawing after sorting and the operation ends. If the values of the present comparison and item positions  $t$  and  $s$  are not the final ones in steps S94 and S98, respectively, the operation goes to step S84 to continue sorting.

FIG. 23 is a flowchart of an example of the slide operation performed in step S80. In step S110 of the drawing, a data item indicated by the variable  $P$  is set in an area WORK, and a value obtained by subtracting one from the variable  $P$  is set in a counter  $C$ . Next, if the value of the counter  $C$  is greater than or equal to zero in step S112, the operation proceeds to step S114 where a data item indicated by the value of the counter  $C$  is shifted backward by one by setting the data item indicated by the value of the counter  $C$  as a data item indicated by a value obtained by adding one to the value of the counter  $C$ .

Thereafter, in step S116, the counter  $C$  is decremented by one, and the operation goes to step S112. If the value of the counter  $C$  becomes zero, the operation goes from step S112 to step S118 where the data item set in the area WORK is set as the top data item, and then, this routine ends.

FIG. 24 is a flowchart of an example of the replacement and slide operation performed in step S90. In step S120 of the drawing, a data item indicated by the present comparison position  $t$  is set in the area WORK, and a value obtained by subtracting one from the present comparison position  $t$  is set in the counter C. Next, if the value of the counter C is greater than or equal to zero in step S122, the operation proceeds to step S124 where a data item indicated by the value of the counter C is shifted backward by one by setting the data item indicated by the value of the counter C as a data item indicated by a value obtained by adding one to the value of the counter C.

Thereafter, in step S126, the counter C is decremented by one, and the operation goes to step S122. If the value of the counter C becomes zero, the operation goes from step S122 to step S128 where the data item set in the area WORK is set as a data item indicated by the present item position  $s$ , and then, this routine ends.

A description will be given of the above-described sorting. As shown in FIG. 25(A), there are eight data items arranged in ascending display order from left to right. The display formats of the data items are indicated by A through C, and the values of the character or numeric character strings of the first items of the data items are indicated by the numbers 1 through 8. In FIG. 25(A), a fourth data item is focused on.

If sorting is initiated in this state, the slide operation is performed to advance the fourth data item to the top and shift the subsequent data items, that is, first through third data items, until the third becomes the fourth, so that a state shown in FIG. 25(B) is entered. Thereafter, in FIG. 25(B), a seventh data item is compared with the

second and third data items without rearrangement,  
and when the present item position s is set to 3 and  
the present comparison position t is set to 7, the  
replacement and slide operation is performed so that  
5 the data items are rearranged to be in a state shown  
in FIG. 25(C).

Although an eighth data item is compared  
with the first through third data items in FIG.  
25(C), the data items are not rearranged as shown in  
10 FIG. 25(D). Thereafter, when the present item  
position s is set to 4 and the present comparison  
position t is set to 8, the replacement and slide  
operation is performed so that the data items are  
rearranged to be in a state shown in FIG. 25(E).

15 If sorting is executed by clicking the  
column header drawing area 70 in a display state  
shown in FIG. 26 where the eighth data item is  
focused on, sorting is sequentially performed as  
described by referring to FIG. 25 so that a display  
20 state shown in FIG. 27 is finally obtained. That is,  
the data items of the same attributes are grouped  
and are rearranged in a character string value order,  
or in ascending order. Therefore, the data items  
are displayed in such a state that the users can  
25 visually recognize the data items with ease.

FIG. 28 is a flowchart of a column display  
width change operation performed by the data item  
list display apparatus of the present invention.  
This operation is performed following the drawing  
30 operation. In step S130 of the drawing, an input is  
awaited. In step S132, it is determined whether the  
drawing operation is canceled to terminate, and in  
step S134, it is determined whether a column width  
is changed.

35 If a column width is changed, the  
operation proceeds to step S136 where the column  
name, column number (icon number), and width of the

changed column are obtained. Next, in step S138, the column master 64 updates the column of width of its position corresponding to the column name and column number of the changed column. Then, in step  
5 S140, the display format master 62 updates the column of the display area size of each data item of its position corresponding to the column name and column number of the changed column. Thereafter, in  
10 step S142, a drawing operation is performed. This drawing operation employs the table 68 of the correspondence between the list display items and the display formats. This table 68 has been created in the previously performed drawing operation. The  
15 drawing operation of step S142 is equal to steps S14 through S32 of FIG. 6.

Thus, the width of a specified one of columns displayed in a list can be changed to a desired size to be displayed. Therefore, the users can easily understand the displayed contents of the  
20 column.

In this embodiment, a data item can be displayed in the same display format in a list of data items of different attributes and in a list of data items of a single attribute. Therefore, the  
25 users can easily understand the lists without confusion, and that at a glance, thus reducing time for overall understanding. Further, numerous data items are displayed in a list on a window so as to be easily understood at a glance, thus allowing even  
30 users without specialized knowledge to use a groupware system easily.

Since icons represent the contents of data items in a display thereof, the contents of the data items can be grasped immediately. Further, the  
35 types of display forms can be changed by using display formats and icons, the users can freely create display forms in quest of ease of visual

recognition. Furthermore, by modifying icons, a list of data items is made understandable to users with low literacy so as to be usable as a teaching material for children of younger age.

5 Steps S10 through S42 correspond to list display means claimed in the appended claims, the display format master 62, the column master 64, and the icon master 66 correspond to a table of  
10 correspondence claimed in the claims, steps S18 through S30 correspond to alignment and display means claimed in the claims, and steps S26, S28, S38, and S42 correspond to area management means claimed in the claims. Further, steps S70 through S128, steps S50 through S64, and steps S130 through S142  
15 correspond to sorting and display means, column header display means, column header width change means each claimed in the claims, respectively.

As previously described, a recording medium as claimed in claim 1 is recorded with a data  
20 item list display program for causing a computer to function as list display means for displaying a plurality of data items in different display forms in a list, the display forms corresponding to respective attributes of the data items.

25 Thus, a plurality of data items are displayed in a list in different display forms corresponding to respective attributes of the data items. Therefore, a data item can be displayed in the same display format in a list of data items of  
30 different attributes and in a list of data items of a single attribute. Hence, users can easily understand the lists without confusion, and that at a glance, thus reducing time for overall understanding. Further, numerous data items are  
35 displayed in a list on a window so as to be easily understood at a glance, thus allowing even users without specialized knowledge to use a groupware

system easily.

According to a recording medium as claimed in claim 2, the program causes the list display means to include a table of correspondence between the attributes and the display forms, and to determine the display forms of the data items displayed in the list by referring to the table by the respective attributes of the data items.

Thus, the list display means includes a table of correspondence between the attributes and the display forms, and determines the display forms of the data items displayed in the list by referring to the table by the respective attributes of the data items. Therefore, by updating the table, the display forms corresponding to the attributes of the data items can be easily changed.

According to a recording medium as claimed in claim 3, the program causes the table to have the display forms corresponding to the attributes and predetermined conditions, and causes the list display means to determine the display forms of the data items displayed in the list by referring to the table by the respective attributes and contents of the data items.

Thus, the table has the display forms corresponding to the attributes and predetermined conditions, and the list display means determines the display forms of the data items displayed in the list by referring to the table by the respective attributes and contents of the data items. Therefore, even if data items are of the same attribute, the data items are displayed in different display forms depending on whether the data items satisfy predetermined conditions, thus making it easy for the users to understand whether the data items satisfy the predetermined conditions.

According to a recording medium as claimed



in claim 4, the program causes the list display means to add icons of different sizes corresponding to the display forms to the data items in displaying the data items.

5                   Thus, icons of different sizes corresponding to the display forms are added to the data items in displaying the data items. Therefore, each of the data items can be displayed with an icon of an appropriate size for its display format, and  
10                   a data item can be displayed with the same icon in a list of data items of different attributes and in a list of data items of a single attribute. Further, since icons represent the contents of data items in a display thereof, the contents of the data items  
15                   can be grasped immediately. Furthermore, the types of display forms can be changed by using display formats and icons, the users can freely create display forms in quest of ease of visual recognition. Moreover, by modifying icons, a list of data items  
20                   is made understandable to users with low literacy so as to be usable as a teaching material for children of younger age.

                  According to a recording medium as claimed in claim 5, the program causes the list display  
25                   means to function as alignment and display means for aligning and displaying each of the data items of the different display forms.

                  Thus, each of the data items of the different display forms is aligned and displayed.  
30                   Therefore, the icons of the data items can be arranged to be displayed in order.

                  According to a recording medium as claimed in claim 6, the program causes the alignment and display means to function as area management means  
35                   for managing an area in which data items are displayed and an area required to display the data items of the respective display forms.

Thus, an area in which data items are displayed and an area required to display the data items of the respective display forms are managed. Therefore, the icons of the data items can be  
5 arranged to be displayed in order.

According to a recording medium as claimed in claim 7, the program causes the list display means to function as sorting and display means for sorting and displaying the data items of the  
10 respective display forms.

Thus, the data items of the respective display forms are sorted and displayed. Therefore, the data items of the respective display forms are rearranged in an order sorted to be displayed so as  
15 to be easily understandable to the users.

According to a recording medium as claimed in claim 8, the program causes the list display means to function as column header display means for displaying a column header corresponding to a  
20 display form of a selected one of the data items displayed in the list.

Thus, a column header corresponding to a display form of a selected one of the data items displayed in the list is displayed. Therefore, the  
25 users can easily understand the displayed contents of the selected one of the data items.

According to a recording medium as claimed in claim 9, the program causes the list display means to function as column display width change  
30 means for changing a column display width of one of the data items which one corresponds to a displayed column header by changing a column display width of the displayed column header.

Thus, a column display width of one of the  
35 data items which one corresponds to a displayed column header is changed by changing a column display width of the displayed column header.

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Therefore, if the displayed contents of a data item do not fit in a column display width, the column display width is widened so that more contents can be displayed.

5           An apparatus as claimed in claim 10 includes list display means for displaying a plurality of data items in different display forms in a list, the display forms corresponding to respective attributes of the data items.

10           Thus, a plurality of data items are displayed in a list in different display forms corresponding to respective attributes of the data items. Therefore, a data item can be displayed in the same display format in a list of data items of  
15 different attributes and in a list of data items of a single attribute. Hence, users can easily understand the lists without confusion.

          According to an apparatus as claimed in claim 11, the list display means adds icons of  
20 different sizes corresponding to the display forms to the data items in displaying the data items.

          Thus, icons of different sizes corresponding to the display forms are added to the data items in displaying the data items. Therefore,  
25 each of the data items can be displayed with an icon of an appropriate size for its display format, and a data item can be displayed with the same icon in a list of data items of different attributes and in a list of data items of a single attribute.

30           According to an apparatus as claimed in claim 12, the list display means includes alignment and display means for aligning and displaying each of the data items of the different display forms.

          Thus, each of the data items of the  
35 different display forms is aligned and displayed. Therefore, the icons of the data items can be arranged to be displayed in order.

According to an apparatus as claimed in claim 13, the list display means includes sorting and display means for sorting and displaying the data items of the respective display forms.

5           Thus, the data items of the respective display forms are sorted and displayed. Therefore, the data items of the respective display forms are rearranged in an order sorted to be displayed so as to be easily understandable to the users.

10           According to an apparatus as claimed in claim 14, the list display means includes column header display means for displaying a column header corresponding to a display form of a selected one of the data items displayed in the list.

15           Thus, a column header corresponding to a display form of a selected one of the data items displayed in the list is displayed. Therefore, the users can easily understand the displayed contents of the selected one of the data items.

20           A method as claimed in claim 15 displays a plurality of data items in different display forms in a list, the display forms corresponding to respective attributes of the data items.

25           By employing this method, the recording medium as claimed in claim 1 and the apparatus as claimed in claim 10 can be realized.

30           According to a recording medium as claimed in claim 16, the program causes the list display means to change types of fonts based on the display forms of the data items in displaying the data items.

35           Thus, types of fonts are changed based on the display forms of the data items in displaying the data items. Therefore, each of the data items can be displayed in a suitable type of font for its display format, and a data item can be displayed in the same font type in a list of data items of different attributes and in a list of data items of

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